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### (54) A PLASTIC FILM FOR USE IN AGRICULTURE

KUNSTSTOFFFOLIE ZUM GEBRAUCH IN DER LANDWIRTSCHAFT

FEUILLE MINCE DE PLASTIQUE UTILISEE EN AGRICULTURE

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**US-A- 4 920 692**

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**Description****Technical Field**

[0001] The present invention relates to a mulch film for use in agriculture.

**Background Art**

[0002] The use of mulch films, that is, plastic films spread along the ground and provided with holes for the sowing of seeds or planting of seedlings, is well-established in agriculture. Their purpose is to promote plant growth by ensuring favorable growth conditions, such as enhanced soil temperatures, as well as reliable weed control without need for herbicides. Such influencing of the plant environment is possible by manipulation of absorptive, reflective and transmissible properties of the mulch film.

[0003] Such a film is known from European Patent Publication No. 0 398 243.

[0004] While, due to photoselective transmission, the green film according to said publication provides a useful answer to the above-mentioned problems, the subject matter thereof does not address the important problem of effective protection against insects that constitute vectors of various plant diseases and require the application of agrochemicals and/or insect netting. Agrochemicals load the environment and insect nets reduce the crop yield, due to their reduction of the transmission of light.

**Disclosure of the Invention**

[0005] It is thus one of the objects of the present invention to provide a mulch film that not only heats the soil it covers and substantially reduces weed growth, but also acts as a repellent with respect to insects, many of which act as disease vectors, this property being based on photoselective reflection of light.

[0006] According to the invention, the above object is achieved by providing a polymeric, multilayer, photoselective mulch film for use in agriculture, comprising at least two layers, an upper layer facing the sky and a lower layer facing the ground, both layers being light-transmissive, wherein said upper layer is of a substantially yellow color and the lower layer is of a substantially blue color, whereby the solar radiation transmitted by said film and reaching the ground is substantially in the green and the far-red range of the solar spectrum, with the green component largely depriving weeds of essential photosynthetically active radiation and the far-red component being absorbed by, and heating, the soil, and whereby the yellow color of the upper layer serves to repel insects liable to act as vectors of plant diseases.

[0007] The invention further provides a method of crop cultivation, comprising the steps of providing a multilayer, light-transmissive mulch film, one layer of which

is yellow and the other layer of which is blue; spreading said mulch film along the ground with the yellow layer facing the sky and the blue layer facing the ground, and providing suitably spaced holes in said film, or using pre-prepared holes in said film, to sow seeds or plant seedlings.

**Detailed Description**

10 [0008] The film proposed by the invention is a UV-stabilized, two-layer, light-transmissive film, preferably produced by co-extrusion from any of the commercially available polymers (polyethylene and its copolymers, PVC, etc.), with one layer of a substantially yellow color

15 and the other layer of a substantially blue color. Together, these two layers transmit about 15-30 percent of the solar energy in the green range, with a maximum at about 0.56  $\mu$ . They also transmit in the far-red region between 0.75-1.1 $\mu$ . The film thus filters out a large part

20 of the photosynthetically active radiation (PAR), thus greatly reducing weed growth which is stunted by the absence of PAR, while passing the far-red, thus warming the soil.

[0009] The characteristic property of the mulch film according to the invention resides, however, in the fact that the yellow surface of the upper film layer is known to repel insects that are likely to act as vectors of various viral plant diseases.

[0010] The method of using the mulch film according to the invention is as follows:

[0011] The film is spread along the ground with the yellow surface facing the sky, and suitably spaced holes are prepared (or pre-prepared holes are used) to sow seeds or plant seedlings.

35 [0012] The mulch film according to the invention originates in a co-extruded tube or hose, which is slit open lengthwise to produce the film. It is, however, quite possible to forego the slitting stage, fill such a tube with soil, close it at both ends and provide the above-mentioned

40 sowing and planting holes. The tube region with the holes would still serve as mulch, and such 'mulch tubes' could be used in regions with poor soil.

[0013] While the above-discussed green color of the light transmitted by the two layers gives excellent results, favorable results are also attainable with violet, orange and brown colors of transmitted light.

[0014] The present embodiments are to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description.

**Claims**

55 1. A polymeric, multilayer, photoselective film for use in agriculture, comprising at least two layers, an upper layer facing the sky and a lower layer facing the ground, each of said layers being of a different color,

and each being light-transmissive;

wherein said upper layer is of a color which repels insects, and said lower layer is of a color whereby the solar radiation transmitted by said film and reaching the ground is of such a spectral composition as will largely deprive weeds of essential photosynthetically active radiation, while having a spectral component that will be absorbed by, and will heat, the ground.

2. A polymeric, multilayer, photoselective mulch film for use in agriculture, comprising at least two layers, an upper layer facing the sky and a lower layer facing the ground, both layers being light-transmissive;

wherein said upper layer is of a yellow color and said lower layer is of blue color;

whereby the solar radiation transmitted by said film and reaching the ground is in the green and the far-red range of the solar spectrum, with the green component largely depriving weeds of essential photosynthetically active radiation and the far-red component being absorbed by, and heating, the soil, and

whereby the yellow color of said upper layer serves to repel insects liable to act as vectors of plant diseases.

3. The mulch film as claimed in claim 1, wherein said two layers are co-extruded.

4. The mulch film as claimed in claim 2, wherein said green component peaks at a wavelength of  $0.56\mu$ , and the far-red component covers the range of  $0.75-1.1\mu$ .

5. The mulch film as claimed in claim 1, wherein the colors of said two layers are such as will produce a transmitted light of a color selected from the group including violet, orange and brown.

6. The mulch film as claimed in claims 1 and 2, whenever used in the form of a tube.

7. A method of crop cultivation, comprising the steps of:

providing a mulch film according to claim 1; spreading said mulch film along the ground with the insect-repelling layer facing the sky and said other layer facing the ground, and providing suitably spaced holes in said film, or using pre-prepared holes in said film, to sow seeds or plant seedlings.

8. A method of crop cultivation, comprising the steps of:

providing a mulch film according to claim 2;

spreading said mulch film along the ground with the yellow layer facing the sky and the blue layer facing the ground, and providing suitably spaced holes in said film, or using pre-prepared holes in said film, to sow seeds or plant seedlings.

#### Patentansprüche

1. Mehrschichtiger fotoselektiver Polymerfilm zum Einsatz in der Landwirtschaft, mit mindestens 2 Schichten: einer oberen himmelwärtigen Schicht und einer unteren bodenwärtigen Schicht, wobei jede Schicht eine unterschiedliche Farbe besitzt und jede lichtdurchlässig ist; wobei die obere Schicht eine Farbe aufweist, die Insekten abstoßt, und die untere Schicht eine Farbe besitzt, wodurch die vom Film durchgelassene Sonnenstrahlung, die den Boden erreicht, eine derartige spektrale Zusammensetzung aufweist, daß Unkräutern essentielle fotosynthetisch wirksame Strahlung entzogen wird, während sie eine Strahlungskomponente aufweist, die vom Boden absorbiert wird und diesen erwärmt.

2. Mehrschichtiger fotoselektiver Polyermulchfilm zum Einsatz in der Landwirtschaft, mit mindestens 2 Schichten, einer oberen himmelwärtigen Schicht und einer unteren bodenwärtigen Schicht, wobei beide Schichten lichtdurchlässig sind; wobei die obere Schicht von gelber Farbe und die untere Schicht von blauer Farbe ist; wobei die vom Film durchgelassene Solarstrahlung, die den Boden erreicht, im grünen und fern roten Bereich des solaren Spektrums ist, wobei die Grünkomponente Unkräuter von essentieller fotosynthetisch aktiver Strahlung abschneidet und die Komponente im fernen Rot vom Boden absorbiert wird und diesen erwärmt; wobei die gelbe Farbe der Oberschicht dazu dient, Insekten abzuschrecken, die als Vektoren von Pflanzenkrankheiten wirken können.

3. Mulchfilm wie in Anspruch 1 beansprucht, wobei die zwei Schichten co-extrudiert sind.

4. Mulchfilm nach Anspruch 2, wobei die Grünkomponente ihr Maximum bei einer Wellenlänge von  $0,56\mu$  besitzt und die im fernen Rot liegende Komponente den Bereich von  $0,75-1,1\mu$  umfaßt.

5. Mulchfilm wie in Anspruch 1 und 2 beansprucht, wobei die Farben der beiden Schichten so sind, daß sie Licht einer Farbe, ausgewählt aus der Gruppe umfassend violett, orange und braun, durchlassen.

6. Mulchfilm wie in Anspruch 1 und 2 beansprucht,

wenn er in Form eines Schlauchs verwendet wird.

7. Verfahren zur Nutzpflanzenkultivierung, mit den Schritten:

Vorlegen eines Mulchfilms nach Anspruch 1; Auslegen des Mulchfilms auf dem Boden, wobei die Insekten abstoßende Schicht himmelwärts und die andere Schicht bodenwärts gerichtet ist; und Schaffen von Öffnungen in geeigneten Abständen in dem Film oder Verwenden von vorbereiteten Öffnungen im Film, um Samen zu säen oder Setzlinge zu pflanzen.

8. Verfahren der Nutzpflanzenkultivierung, mit den Schritten:

Vorlegen eines Mulchfilms nach Anspruch 2; Auslegen des Mulchfilms auf dem Boden, wobei die gelbe Schicht himmelwärts und die blaue Schicht bodenwärts gerichtet ist, und Schaffen von Öffnungen mit geeignetem Abstand in dem Film oder Verwenden von vorbereiteten Öffnungen im Film ,um Samen zu säen oder Sämlinge zu pflanzen.

**Revendications**

1. Film polymère, multicouche, photosélectif pour une utilisation en agriculture, comprenant au moins deux couches, une couche supérieure tournée vers le ciel et une couche inférieure tournée vers le sol, chacune desdites couches étant d'une couleur différente et chacune transmettant la lumière ; dans lequel ladite couche supérieure est d'une couleur qui repousse les insectes, et ladite couche inférieure est d'une couleur grâce à quoi le rayonnement solaire transmis par ledit film et atteignant le sol est d'une composition spectrale telle qu'elle privera en grande partie les mauvaises herbes du rayonnement actif de façon photosynthétique essentiel, tout en ayant une composante spectrale qui sera absorbée par le sol et le chauffera.

2. Film couverture polymère, multicouche, photosélectif pour une utilisation en agriculture, comprenant au moins deux couches, une couche supérieure tournée vers le ciel et une couche inférieure tournée vers le sol, les deux couches transmettant la lumière ; dans lequel ladite couche supérieure est de couleur jaune et ladite couche inférieure est de couleur bleue ; grâce à quoi le rayonnement solaire transmis par ledit film et atteignant le sol est dans le domaine du vert et dans le domaine du rouge lointain du spectre

solaire, avec la composante de vert privant en grande partie les mauvaises herbes du rayonnement actif de façon photosynthétique essentiel, et la composante de rouge lointain étant absorbée par le sol et le chauffant, et grâce à quoi la couleur jaune de ladite couche supérieure sert à repousser les insectes responsables d'agir comme des vecteurs de maladies des plantes.

3. Film couverture selon la revendication 1, dans lequel lesdites deux couches sont coextrudées.

4. Film couverture selon la revendication 2, dans lequel ladite composante de vert atteint un maximum à une longueur d'onde de  $0,56 \mu\text{m}$ , et la composante de rouge lointain couvre le domaine de  $0,75 - 1,1 \mu\text{m}$ .

5. Film couverture selon la revendication 1, dans lequel les couleurs desdites deux couches sont telles qu'elles produiront une lumière transmise d'une couleur choisie à partir du groupe incluant le violet, l'orange et le brun.

6. Film couverture selon les revendications 1 et 2, chaque fois utilisé sous la forme d'un tube.

7. Procédé de culture, comprenant les étapes de :

- fournir un film couverture selon la revendication 1 ;

- étendre ledit film couverture le long du sol avec la couche repoussant les insectes tournée vers le ciel et ladite autre couche tournée vers le sol, et

- prévoir dès trous espacés de façon appropriée dans ledit film, ou utiliser des trous préparés dans ledit film, pour semer des graines ou planter des plants.

8. Procédé de culture, comprenant les étapes de :

- fournir un film couverture selon la revendication 2 ;

- étendre ledit film couverture le long du sol avec la couche jaune tournée vers le ciel et la couche bleue tournée vers le sol ; et

- prévoir des trous espacés de façon appropriée dans ledit film, ou utiliser des trous préparés dans ledit film, pour semer des graines ou planter des plants.